DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12/07/2009 has been entered.

Response to Amendment

2. The amendments, filed on 12/07/2009, have been entered and made of record. Claims 1-8, 10-19, 21-30 and 32-36 are pending.

Response to Arguments

3. Applicant's arguments with respect to claims 1-8, 10-19, 21-30 and 32-36 have been considered but are moot in view of the new ground(s) or rejection.

Claim Rejections - 35 USC § 102

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
5. Claims 1-3, 5, 14-16, 25-27, and 36 are rejected under 35 U.S.C. § 102(b) as being unpatentable over Ishikawa (US 6,549,650).

Regarding claim 1, Ishikawa discloses a method for generating a wide image video sequence (moving panoramic image) using a device (a binocular image sensing apparatus 6001, Fig 38) having at least two video cameras substantially co-located in a predetermined relationship to each other (right and left image sensing optical systems 6004b and 6004a, Fig 38) such that there will be an overlap between images from the respective cameras (synthesizing the right and left images 6201b and 6201a into a single panoramic image, an overlapping region for joining the two, Fig 40), said method comprising the steps of:

a. forming a synthetic image from images of the respective cameras (two images 6201b' and 6201a' are synthesized into a single panoramic synthesized image, Fig 40) by (i) identifying corresponding parts in overlapping parts of the images (the two images 6201b and 6201a are directly synthesized by assigning a predetermined overlapping amount, step S1214, Fig 39), (ii) determining the relation between the respective coordinates for the pixels in the individual cameras and in the synthetic image (the image correction/overlapping amount calculator 6016 detects the overlapping regions of the images 6201b' and 6201a' by finding correspondences among their pixel values using an algorithm such as template matching, step S1214, Fig 39), and (iii) calculating calibration parameters from said relation, said calculated calibration parameters being unique for the at least two cameras and their current location as related to the object being recorded (in step S1215, the image correction/overlapping amount calculator 6016 corrects the sensed images, i.e., compensates for the luminance and color differences between the two, right and left images that may be produced

by the image sensing optical systems 6004b and 6004a, and corrects trapezoidal distortion (projection transform), as Fig 41 shows the correction state of luminance values that may become discontinuous at the joint portion between the right and left parallax images 6201b' and 6201a') (col. 36, line 32 to col. 37, line 22);

b. synchronously recording video sequences using each of said at least two video cameras (the right and left images are sensed in step S1208 as the right and left images that may be produced by the image sensing optical systems 6004b and 6004a) (col. 37, lines 6-22); and

c. generating a wide image video sequence by combining said synchronously recorded video sequences using said calculated calibration parameters (the convergence angle θ_{LM} is calculated based on the depth z detected in step S1801), wherein the step of calculating calibration parameters comprises the step of calculating a projective transform by comparing spatial characteristics of said corresponding parts with each other, and wherein the step of generating the wide image video sequence is performed using said projective transform (in step S1802, the calculated convergence angle θ is compared with the limit value θ_{LM} of the convergence angle held in a memory of each of the image sensing optical system drivers, as the method of controlling the image sensing optical systems 6701b and 6701a to reduce to zero, i.e. performing projective transform, the parallax of the principal object 6904, which is located 1 m in front of the image sensing optical systems 6701b and 6701a) (col. 43, lines 4-22).

Regarding claim 2, the limitations of claim 1 are taught above, Ishikawa discloses the synchronously recorded video sequences are stored in a memory means (a memory 6007, Fig 38) (col. 34, line 55 – col. 35, line 2).

Regarding claim 3, the limitations of claim 1 are taught above, Ishikawa discloses the synchronously recorded video sequences are used concurrently for generating the wide image video sequence (moving panoramic image) (col. 35, lines 14-28).

Regarding claim 5, the limitations of claim 1 are taught above, Ishikawa discloses the wide image video sequence (moving panoramic image) is stored on a memory means (a memory 6007, Fig 38) (col. 34, line 55 – col. 35, line 2).

Regarding claim 14, this claim differs from claim 1 only in that the claim 1 is a method claim whereas claim 14 recites similar features in an apparatus format. Thus the apparatus claim 9 is analyzed and rejected as previously discussed with respected to claim 1 above.

Regarding claims 15 and 16, these claims recite same limitations as claims 2 and 3, respectively. Thus they are analyzed and rejected as previously discussed with respect to claims 2 and 3 above.

Regarding claim 25, this claim recites same limitations as claim 1. Thus it is analyzed and rejected as previously discussed with respect to claim 1 above.

Regarding claims 26 and 27, these claims recite same limitations as claims 2 and 3, respectively. Thus they are analyzed and rejected as previously discussed with respect to claims 2 and 3 above.

Regarding claim 36, this claim recites substantially the same limitations as claim 1. Thus it is analyzed and rejected as previously discussed with respect to claim 1 above.

Claim Rejections - 35 USC § 103

6. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

7. Claims 1-3, 5-8, 10, 14-19, 21, 25-30, 32, and 36 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishikawa (US 6,549,650) in view of Chang (US 7,307,654).

Regarding claim 6, the limitations of claim 1 are taught above, Ishikawa does not disclose a detailed calibration process according to this claim. However, Chang discloses calculating the calibration (calibration process 102, Fig 3); comprises the following steps:

a. starting of calibration process (step 110, Fig 3) (at 110, a predesigned calibration pattern 50 is displayed in front of planar background 18, i.e. on front planar surface 44) (4:56-5:11, Chang);

b. synchronizing the sequences from each of the at least two cameras (blocks 112 and 116 occur simultaneously, and blocks 114 and 118 occur simultaneously or near simultaneously) (4:56-5:11, Chang);

c. computing inter-image projective transformations (step 122, Fig 3) (the correspondence mapping and geometric parameters of planar background 18 determined at 120 are utilized to compute both internal and external calibration parameters of first camera 14 and second camera 16) (5:32-53, Chang);

d. using the transformations to refer each image to a common reference frame (step 120, Fig 3) (at 120, CPU 30 compares the robust features from the first and second images to the known characteristics of calibration pattern 50 and performs a correspondence mapping and the correspondence mapping entails locating each

captured robust characteristic of calibration pattern 50 in first image 14 and noting the spatial relationship of the captured robust characteristics) (5:12-31, Chang);

e. selecting a real or virtual reference camera such that certain lines on the pitch or stadium arc substantially horizontal and substantially parallel in the wide image (step 122, Fig 3) (the overall spatial relationship of first camera 14, second camera 16, and planar background 18 is used to determine a first coordinate system with respect to first camera 14 and a second coordinate system with respect to second camera 16) (5:32-53, Chang);

f. selecting a rectangular region of interest within the wide image (the correspondence mapping and geometric parameters of planar background 18, Fig 1, as the planar background 18 is determined at 124 based upon the calibration parameters of each camera) (5:32-53, Chang); and

g. storing the computed values resulting from the calibration process to be used as the calibration parameters (once the two coordinate systems are derived, the calibration process is complete and the first subject image or video is recorded by first camera 14 and transferred to CPU 30 via first video capture device 32) (5:32-6:7, Chang).

Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to include the calibration process as taught by Chang into Ishikawa's device, as the suggestion/motivation would have been to enable the controller which is capable of performing the calibration, analysis, and interpolation computations to derive a synthesized image, to create synthesized images allows the user to select the most

satisfactory angle to view the scene in order to better ensure that the specific region of interest at a particular time instance is accessible to the user (3:29-46 and 10:50-64, Chang).

Regarding claim 7, the limitations of claims 1 and 6 are taught above, Ishikawa does not disclose the step of determining lens distortion parameters for each camera and correcting radial distortion in each image. However, Chang discloses the step of determining lens distortion parameters for each camera, and correcting radial distortion in each image (adapted to stretch the synthesized video image on the video display 20 to remove any parallax distortions) (3:47-67, Chang).

Regarding claim 8, the limitations of claims 1 and 6 are taught above, Chang discloses the step of selecting non-linear distortion parameters to reduce perspective distortion of the image (the internal calibration parameters include but are not limited to the focal length and lens distortion of each camera) (5:32-53, Chang).

Regarding claim 10, the limitations of claim 1 are taught above, Chang discloses the step b (step 114 and 118, Fig 3) is performed automatically by an algorithm for identification of corresponding features in concurrent video images and the coordinates for the corresponding features are input via a computer means (the second image is transferred from second camera 16 to CPU 30 via second video capture device 34. CPU analyzes the second image for the robust features of calibrated pattern 50) (4:56-5:11 and Fig 3, Chang).

Regarding claims 17, 18, 19, and 21, these claims recite same limitations as claims 6, 7, 8, and 10, respectively. Thus they are analyzed and rejected as previously discussed with respect to claims 6, 7, 8, and 10 above.

Regarding claims 28, 29, 30, and 32, these claims recite same limitations as claims 6, 7, 8, and 10, respectively. Thus they are analyzed and rejected as previously discussed with respect to claims 6, 7, 8, and 10 above.

8. Claim 4 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishikawa (US 6,549,650) in view of Alonso (US 6,445,293).

Regarding claim 4, the limitations of claim 1 are taught above, Lee and Chang do not disclose the wide image video sequence is transmitted live. However, Alonso discloses the wide image video sequence is transmitted live (the camera system sets the front camera as output image and transmits live video out from this camera) (3:56-65, Alonso).

Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to include the imaging pickup device as taught by Alonso into Lee and Chang's device, as the suggestion/motivation would have been to guarantee that the camera system will remain in the alarm state in case of an emergency (1:36-39 and 3:41-45, Alonso).

9. Claims 11, 13, 22, 24, 33, and 35 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishikawa and Chang, and further in view of Matsumoto (US 2003/0071906).

Regarding claim 11, the limitations of claim 1 are taught above, Chang discloses the method according to claim 1 which comprises the following steps:

a. apply the calculated calibration parameters (at 110, a predesigned calibration pattern 50 is displayed in front of planar background 18, i.e. on front planar surface 44) (4:56-5:11 and step 110, Fig 3, Chang);

c. retrieving one new image from each camera (at 112, first camera 14 captures a first image of calibration pattern 50 and at 116, second camera 16 captures a

second image of calibration pattern 50) (4:56-5:11 and steps 112 and 116, Fig 3, Chang);

d. selectively updating the parameters needed to transform intensities in one or more of the cameras to eliminate visible seams (correspondence mapping entails locating each captured robust characteristic of calibration pattern) (5:12-31 and step 120, Fig 3, Chang);

e. selectively adjusting intensities in the images from one or more of the cameras (a similar correspondence mapping procedure is completed using the second image to determine the geometric parameters of planar background 18 with respect to second camera 16) (5:12-31 and step 120, Fig 3, Chang);

f. creating the current seamless, wide image from the current images from each camera (map corresponding robust features to determine geometric parameters of planar background, since the calibration pattern 50 is a planar surface located upon planar background 18, the geometric parameters of planar background with respect to first camera 14 are directly computed from the mapped correspondence information) (5:12-31 and step 120, Fig 3, Chang); and

g. outputting the image to a display or to a memory storage area (storage device 37, Fig 1) (after all calibration parameters are determined, the overall spatial relationship of first camera 14, second camera 16, and planar background 18 is determined at 124 based upon the calibration parameters of each camera and the image is to a display or to a memory means) (5:32-53, Chang).

Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to include the calibration process as taught by Chang into Ishikawa's device, as the suggestion/motivation would have been to enable the controller which is capable of performing the calibration, analysis, and interpolation computations to derive a synthesized image, to create synthesized images allows the user to select the most satisfactory angle to view the scene in order to better ensure that the specific region of interest at a particular time instance is accessible to the user (3:29-46 and 10:50-64, Chang).

Ishikawa and Chang do not disclose a calibration process is repeated until the end of the sequence is reached or return to step b until end of generation of the video sequence. However, Matsumoto disclose a calibration process is repeated until the end of the sequence is reached (the calibration process is repeated at a predetermined interval until the release switch (SW1) 126 or the release switch (SW2) 127 is pressed, Figs 7-9) ([0183], Matsumoto)

Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to include the calibration process as taught by Matsumoto into Ishikawa and Chang's device, as the suggestion/motivation would have been to enable that the more accurate correction data can be obtained ([0183], Matsumoto).

Regarding claim 13, the limitations of claims 1 and 11 are taught above, Chang discloses the new images from each video camera are read from a memory means (storage device 37, Fig 1) (after all calibration parameters are determined, the overall spatial relationship of first camera 14, second camera 16, and planar background 18 is determined at 124 based upon the calibration parameters of each camera and the image is to a display or to a memory means) (5:32-53, Chang).

Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to include the calibration process as taught by Chang into Lee's device, so as the image data (e.g., video images, image shape and color information) stored in storage device 37 will be available for use at a later time (6:63-7:20 Chang).

Regarding claims 22 and 24, these claims recite same limitations as claims 11 and 13, respectively. Thus they are analyzed and rejected as previously discussed with respect to claims 11 and 13 above.

Regarding claims 33 and 35, these claims recite same limitations as claims 11 and 13, respectively. Thus they are analyzed and rejected as previously discussed with respect to claims 11 and 13 above.

10. Claims 12, 23 and 34 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishikawa, Chang and Matsumoto, and further in view of Alonso (US 6,445,293).

Regarding claim 12, the limitations of claims 1 and 11 are taught above, Ishikawa, Chang and Matsumoto do not disclose the new images from each camera are read from live sources, each such source comprising a video camera. However, Alonso discloses the new images from each camera are read from live sources, each such source comprising a video camera (the camera system sets the front camera as output image and transmits live video out from this camera) (3:56-65, Alonso).

Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to include the imaging pickup device as taught by Alonso into Ishikawa, Chang and Matsumoto's device, so as the camera system will be capable to used by the main

system to increase system versatility and can get any advanced feature shown in the main video system (3:41-45, Alonso).

Regarding claims 23 and 34, these claims recite same limitations as claim 12. Thus they are analyzed and rejected as previously discussed with respect to claim 12 above.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- Katayama et al. (US 7,098,914) provide an image synthesis method, an image synthesis apparatus, and a storage medium in which a mapping mode is easily set when synthesizing an image;
- Hubel et al. (US 6,930,703) provide a method and apparatus for automatically capturing a plurality of images during a pan;
- Murata et al. (US 7,313,289) disclose an image processing method that effectively corrects the image distortions caused by oblique imaging in which an original image on the object plane is taken from an oblique direction, and provides an improved operability for the user; and
- Colavin et al. (US 7,064,783) disclose a still picture format for subsequent picture stitching for forming a panoramic image.

Inquiries

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kent Wang whose telephone number is 571-270-1703. The examiner can normally be reached on 8:00 A.M. - 5:30 PM (every other Friday off).
Sinh Tran can be reached on 571-272-7564. The fax phone number for the organization where this application or proceeding is assigned is 571-270-8300.

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